

# MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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## INTRODUCTION.

The REVIEW for April, 1895, is based on reports from 3,254 stations occupied by regular and voluntary observers. These reports are classified as follows: 148 reports from Weather Bureau stations; 35 reports from U. S. Army post surgeons; 2,390 monthly reports from State Weather Service and voluntary observers; 30 reports from Canadian stations; 96 reports through the Southern Pacific Railway Company; 624 marine reports through the cooperation of the Hydrographic Office, Navy Department, and New York Herald Weather Service; monthly reports from 30 U. S.

Life-Saving stations; monthly reports from local services established in all States and Territories; and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

The WEATHER REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by the Division of Records and Meteorological Data, in charge of Mr. A. J. Henry, chief of that division.

## CHARACTERISTICS OF THE WEATHER FOR APRIL, 1895.

The month was characterized by the infrequency and slow movement of storm areas. The temperature was generally in excess over the interior of the country and the pressure was slightly deficient. Dry winds and duststorms prevailed fre-

quently from Texas to Manitoba. The rainfall was in excess throughout the Atlantic States, but generally deficient in the interior. Remarkable river floods occurred on the 9th and 10th in the middle and south Atlantic States, and on the 15th and 16th throughout New England.

## ATMOSPHERIC PRESSURE (*in inches and hundredths*).

By Prof. FRANK H. BIGELOW.

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers not reduced to standard gravity and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart II. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

During the current month the highest mean pressures were on the coasts of Massachusetts, Rhode Island, and Connecticut, the southern coast of Florida, the upper Lake region, and the coasts of southern Washington, Oregon, and California. The extreme highest were: Eureka, 30.12; San Francisco, 30.11; White River, 30.10; Sault Ste. Marie, 30.07. The lowest mean pressure was in Assiniboia, 29.89 at Battleford; at Yuma the mean was 29.90.

As compared with the normal for April the mean pressure for the current month was slightly deficient in the interior. The maximum deficit was 0.10 at Concordia. Pressure was in excess on the Pacific coast, plateau region, and especially the east Atlantic coast. The maximum excess was 0.16 at Sydney.

As compared with the preceding month of March, the pressures reduced to sea level show a rise on the Atlantic and Pacific coasts; the maximum rise was 0.30 at St. Johns, N. F., and the maximum fall 0.14 at Sioux City, North Platte, and Wichita.

The systematic periodic diurnal variations of pressure are shown by the hourly means given in Table V.

### HIGH AND LOW AREAS.

Instead of describing all the high areas in succession by themselves, and then all the low areas by themselves, it seems more natural to consider the interactions between the highs and the lows, in their eastward drift, as counterparts of a system of surface circulation, and to discuss them simultaneously. Accordingly a section will be devoted to the tracks of the high areas, another will be given to the low areas, and a third will contain such descriptive matter as appears to be properly suggested by the special features characteristic of the April weather conditions.

### HIGH AREAS.

An inspection of the tracks of the centers of the high areas for April exhibits, in many respects, a very instructive view of the tendency to move in certain well-defined paths, that is really characteristic of all anticyclonic circulation in the United States at all seasons of the year. Originating on the middle Pacific coast, or in the extreme northwestern territory, the highs may reach the Atlantic Ocean by two distinct circuits, (1) over the Lake region and the St. Lawrence Valley, and (2) over the Rocky Mountain slope, the Gulf States, and the Atlantic coast. The former may be called the "northern" circuit and the latter the "southern" circuit.

These paths are no doubt determined chiefly by two principal agencies, (1) the general circulation of the atmosphere, by which a high pressure belt tends to be formed along the parallels  $30^{\circ}$  to  $35^{\circ}$  and a low pressure belt along the parallels near  $55^{\circ}$ , and (2) by the relations of the continental configurations, including mountain ranges and coast lines, to the masses of water, lakes and oceans. In each case the distribution goes back to the distributions of temperature generated (1) by the solar radiation upon the tropics, and (2) by the conservation or differential radiation of the land and water masses. It will also be seen by comparison of the temperatures and pressures with the variations of the polar magnetic radiation from the sun that for the belts above mentioned the tendency is to break up into isolated masses, or highs and lows, in response to this variable radiation, which is superposed upon the resultant effect of the equatorial radiation combined with the forces depending upon the gravitation and rotation of the earth. The very many forms of storm development may easily be traced back to these primary forces; the uncertainty whether an individual storm may pursue the northern or the southern circuit is the chief source of doubt in weather forecasting.

In April the location of the high area tracks is as follows:

I.—On the morning of April 1 this was central in southern Wyoming, moving thence southeastward it passed over the Gulf States on the 3d and 4th, and during the 5th, 6th, 7th, and 8th it passed northward, skirting the Atlantic seaboard to Newfoundland, where it disappeared on the morning of the 9th from the territory of observation.

II.—This high began to develop on the California coast during the 2d, settled somewhat to the southward during the 3d, turned back northward on the 4th and 5th, crossed the Columbia River Valley in the Rocky Mountains on the 6th, passed southward to Colorado, with a very strong tendency to follow the summit of the highest elevations in the range, 5,000 feet altitude, and dissipated after some uncertain movements during the 8th. This area entered the southern circuit, but failed to sustain itself during the eastern portion of its path.

III.—This high originated between the one hundred and fifth and one hundred and tenth meridians north of Montana on the 8th, moved directly eastward over the Lake region during the 9–10th, reached the Atlantic coast near Massachusetts on the afternoon of the 11th; thence it turned abruptly northeastward, followed the coast line to Newfoundland, and then instead of disappearing to the eastward it moved westward up the St. Lawrence Valley and united with IV *b* on the morning of the 16th in the neighborhood of Father Point, Que. The new configuration, III and IV *b*, continued to the west as far as Lake Huron on the 18th, whence it moved southward over Lower Michigan, Indiana, eastern Kentucky to Georgia, where the combined high dissipated on the morning of the 20th. This is evidently a remarkable example of a sluggish or suspended general eastward drift, in consequence of which two highs, III and IV *b*, at one time far apart, united together and moved wholly away from the mean tracks, namely, from the northern to the southern circuit across the central valleys.

IV.—This high also had a remarkable track. It developed on the middle Pacific coast on the afternoon of the 9th, pursued the same course from the west coast to the eastern side of the mountains, that is, it moved northward on the 10th, crossed the Columbia Valley on the 11th, skirted the high elevations southeastward on the 12th, and entered the Gulf States on the 13th. In Oklahoma, on the morning of the 13th, the high began to divide into two centers, Nos. IV *a* and IV *b*. The former, No. IV *a*, moved eastward over the Gulf States during the 14th and settled upon southern Florida, where it broke up on the 15th of the month. The latter, No. IV *b*, moved rapidly northward from Oklahoma to

Lake Superior, lingered over the Lakes during the 14–15th, united with No. III in lower Canada on the 16th, redoubled on itself, and finally dissipated in Georgia, as already described in connection with No. III.

V.—This high was generated on the southern Pacific coast on the evening of the 12th, moved to northern California by the 14th, crossed the mountains south of the Columbia Valley and the elevated land of northern Nevada, 5,000 to 6,000 feet, during the 15th, and died out in Colorado on the 16th of the month.

VI.—This high also had a short track, beginning on the middle Pacific coast on the 16th, passed the Columbia Valley on the 17th, and faded away in Montana during the 18th.

VII.—This high developed on the Pacific coast of Washington on the afternoon of the 18th, crossed the Rocky Mountains well to the northward on the 20th, moved southward along the elevated lands during the 21st and 22d, and on the 23d was in southern Texas, whence it passed along the Gulf coast, and on the 23d, p. m., united with high area No. VIII, and then continued its course along the Gulf and Carolina coasts, where the entire high area disappeared on the 25th near Hatteras.

VIII.—This high formed in northern Florida on the morning of the 21st, settled to the south of Florida during the 22d, and on the 23d was drawn into the high area, No. VII, then approaching from the west, in union with which it passed to the Carolina coast and was dissipated. Nos. VII and VIII are clearly instances of action in the southern circuit.

IX.—This high was formed near the one hundred and fifteenth meridian, north of Montana, on the 24th, and moved directly eastward over the Lakes and the St. Lawrence Valley to the Gulf of Newfoundland, where it died out on the morning of the 28th. No. IX is a simple case of movement in the northern circuit. On the 30th a high was forming over the upper St. Lawrence Valley, but it had no motion to be recorded in April.

The marked feature of the movement of the high areas in April is the fact that none of them passed from the land to the ocean areas lying east of the Gulf of St. Lawrence, but that they all followed the main paths of normal movement, with slight disturbance.

#### LOW AREAS.

On comparing the tracks of the high and low areas as given on Charts I and IV, it is seen that in the northern circuit across the Lakes they both lie on the same ground, as if they followed each other in the eastward movement. In the case of the Rocky Mountain and southern circuit, it is easily perceived that the tracks of the lows lie to the eastward of the highs in the Rocky Mountain districts, and to the northward of the same in the Gulf States, both together hugging the coast line in the Atlantic States. The tracks of the highs in the Rocky Mountains lie over the elevations of 5,000 to 6,000 feet, while the lows are over the elevations of 1,000 to 2,000 feet, in general a difference of 4,000 feet. This fact is clearly of importance in the study of storm generation, and points to some basis, probably the effect of the temperature of these respective elevations upon the density of the air. In the same way the relatively small difference of temperature in April between the water areas and the contiguous land areas causes the tracks of highs and lows to agree more closely with each other in location.

I.—This low on the morning of April 1 was found central in Ohio; it moved to the Virginia coast, and during the 2d showed some uncertainty in its direction, but during the 3d and 4th it moved along the coast line to Newfoundland and disappeared from the map on the morning of the 5th.

II.—This low originated near the one hundred and twenty-



It is thus brought to evidence that all the lows of April, except two, Nos. I and XI, originated in a very narrow territory in the extreme northwest, viz, the Rocky Mountain district just north of the Columbia River. From this and many other studies into the origin of the storms it is seen that this is the especial theater of storm development, and it may naturally be inferred that meteorological observations of every description ought to be prosecuted in this district with especial vigor.

#### DAILY SYNOPSIS OF STORMS AND WEATHER CONDITIONS.

1. The month of April opened with an area of high pressure, 30.20, covering the Rocky Mountain districts, and a general storm that filled the central valleys and Eastern States; the isobars were elongated from northeast to southwest; rain fell in the Mississippi Valley, the Lake region, the middle, south Atlantic, and Gulf States, and rain, turning into snow, in the Missouri Valley. The temperature was rising generally east of the Mississippi and falling to the west of it.

2. The storm central over the Ohio Valley on the morning of the 1st passed off the middle Atlantic coast attended by rain in the New England and the middle Atlantic States, and over the Ohio and Upper Mississippi valleys, with occasional rains on the middle Gulf coast. The temperature fell in the Ohio Valley, and thence over the middle Mississippi, the Western and Southwestern States, and rose in the south Atlantic States and the extreme northwest. Pressure was high from Lake Superior and Minnesota over the middle and southern Rocky Mountain regions, and also on the middle Pacific coast. Light frosts were reported in southwestern Kansas. A storm was advancing from the north Pacific coast to the region north of Montana, attended by rain in the north Pacific coast States.

3. The storm moved from the Virginia coast and was central off the Massachusetts coast, increased in energy, and was attended by brisk northwest winds, with snow, on the New England coast, and showers in the Atlantic coast States. The temperature fell in the Southern States and the extreme northwest, and rose in the Missouri Valley and the middle Rocky Mountain districts. Light frosts were reported in the middle Mississippi Valley, Arkansas, and the extreme northeastern portions of Texas. Heavy precipitation was reported during the 2d or 3d at Norfolk, 1.06; Titusville, 1.22; Jupiter, 1.12; Key West, 1.10; Tampa, 2.70.

4. The storm moved from Nantucket to the northeastward of Newfoundland. The storm in the extreme northwest increased in strength and was central north of Montana. An area of high pressure moved eastward over the Southern States, attended by light frosts in the northern portion of the east Gulf and south Atlantic States. Generally fair weather prevailed, except in the north Pacific coast districts, where it was cloudy or rainy. The temperature rose generally, except over the south Atlantic States and the extreme northwest, where it fell about 10°.

5. A storm of marked intensity moved southeastward over the Rocky Mountain slope and occupied the Missouri Valley, isobars elongated north and south; lowest reading of barometer was 29.29 at Huron, with high northwest winds. An area of high barometer occupied the Pacific coast and the western plateau region; the pressure in the east was high over the middle and south Atlantic. This arrangement of highs and the central low may be selected as an especially fine example of normal storm formation in the United States, agreeing almost perfectly with the mean of 10 storms of this type, prepared for special studies. The temperature rose generally east of the Rocky Mountains and fell decidedly over the plateau regions. The weather was generally fair throughout this entire storm region, but showers occurred on the

Pacific coast in the middle of the high barometer. This is also an important example of a fully developed cyclonic circulation without precipitation, all that actually occurred being located in the midst of the descending air of the Pacific anticyclone. It is also a typical example of eastward movement in the southern circuit, the axis of development extending from the northern Rocky Mountain districts to the south Atlantic coast. Rain was, however, beginning in the Upper Mississippi Valley as a consequence, not a cause, of the cyclonic action of the air.

6. The storm passed from the Missouri Valley southward over eastern Kansas, attended by showers in the central valleys and the Lake region. The lowest barometer was 29.24, at Wichita, and the winds around the center were high, though not dangerous. An area of high pressure covered the Rocky Mountain districts and the barometer was also high over New England. The temperature rose generally east of the Mississippi and fell decidedly in the Western and Southwestern States, viz, 20° to 30° in twenty-four hours.

7. The storm in Kansas remained nearly stationary, though it moved slightly eastward, diminishing in energy. The high pressure overspread the Rocky Mountain region, and the barometer continued high over New England. The temperature fell in the Mississippi Valley and the southwest, and rose in the Rocky Mountain regions and the northwest. Showers occurred throughout the central valleys and Lake region, also in New York and Pennsylvania. Heavy precipitation was reported from 10 stations in the middle Gulf States.

8. The storm moved northeastward, and on the morning of the 8th was central over Lower Michigan; the high in the west extended to Texas, and the high over New England moved slowly eastward. The temperature rose in the middle Atlantic and southern New England States, and remained nearly stationary in the other districts. The rain area stretched over the region from the central valleys to the Atlantic coast; heavy rain fell in the Atlantic coast States south of Pennsylvania and in portions of the Ohio Valley. Fair weather prevailed in the Southwestern States and Rocky Mountain districts and thence to the Pacific coast. In the case of this storm the high winds threatened on the 6th seem to have been dissipated in the production of precipitation, the isobars in the meanwhile flattening themselves into the loose form characterizing rain areas. The persistent action of the New England high, after its transition to the northern circuit, aided the formation of rain conditions.

9. The storm moved eastward to New England, attended by heavy rains in the Atlantic coast States, and with moderate rain in the Ohio Valley and the Lake region. The barometer rose considerably in the northwest, which, in conjunction with the New England high, continued to give energy to the eastern storm. The temperature rose in New England, and fell in the region north of Montana and Dakota, but remained stationary elsewhere. Heavy precipitation was reported at the following stations during the 8th or 9th: Chapel Hill, 4.80; Moncure, 3.70; Fayetteville, 1.60; Salem, 2.00; Clarks-ville, 2.40; Danville, 1.80; Block Island, 1.60; Albany, 1.36; Harrisburg, 1.08; Baltimore, 1.30; Hatteras, 1.68; Wilmington, 1.02; Philadelphia, 2.76; Quebec, 1.08; Montreal, 1.20; Dubois, 1.70; Ridgway, 1.63; Rowlesburg, 1.60.

10. The storm moved from the Middle States over New England to New Brunswick, attended by gales along the middle Atlantic and New England coasts, and by rain from the Upper Ohio Valley and the eastern Lake region over the middle Atlantic and New England States. Showers also occurred in the northwest, and rain fell in the middle and north Pacific coast districts. The area of high barometer extended from Manitoba over the upper Lake region; the barometer was also high on the middle Pacific coast. The temperature fell in New England, the Middle States, and the Lake region; it

rose in the west and the southwest. As a result of the heavy rains the rivers rose in many places; at Pittsburg, 11 feet, on the morning of the 10th, being 2.6 feet below the danger line; at 2 p. m. it reached 21.1 feet, the danger line being 22 feet. The water was, however, reported as falling at the head of the Alleghany and Monongahela rivers.

11. The eastern storm had moved out of the region of observation beyond Newfoundland. A disturbance of slight energy now occupied the Western and Northwestern States, with an area of high pressure covering the Middle States, and a second area of higher pressure occupying the Pacific coast. The temperature fell in the middle Atlantic and New England States, and in the middle and north Pacific coast districts, and rose in the west and northwest. Generally fair weather prevailed, except in the Missouri and extreme Upper Mississippi valleys where showers occurred.

12. The barometer was above the normal over the entire country, though relatively low in a trough extending from the Upper Lake region and Manitoba over the Upper Mississippi Valley. It was highest over New England and over the Rocky Mountain districts. The temperature rose over the Ohio Valley, the Lake region, and New England, and fell in the northwest. Showers occurred in the Ohio and Upper Mississippi Valleys and the Upper Lake region. The weather was generally fair in the other districts.

13. The storm moved eastward over the Lake region, increasing slightly in strength, attended by rain from the Lake region and New England over the Ohio Valley and Tennessee, the weather being generally fair in the other districts. The area of high pressure moved southeastward over the mountain districts and was central over Oklahoma, a fall of temperature taking place in the central valleys. The precipitation was heavy to the southward of the center of the low: at Johnstown, 1.58; Mahoning, 1.58; West Newton, 1.50.

14. The eastern storm was central southeast of New England, in consequence of which rain fell in New England and southward to the Carolinas. The northwest winds were high at some points on the coast. A trough of low pressure extended from Manitoba to northwestern Texas, with indications of development of a storm of marked intensity; at some stations the wind reached a velocity of more than 40 miles per hour. An area of high pressure to the eastward covered the western Lake region and the Ohio Valley. The pressure was also rising on the south Pacific coast. The temperature fell decidedly in the Rocky Mountain and plateau regions, but was stationary in nearly all the other districts. In spite of the fact that a very well-defined system of isobars, indicating precipitation, existed in the Missouri Valley, the region was quite free from showers. This is the second clear illustration that precipitation is not necessarily a preliminary or cause of the cyclonic circulation of the atmosphere, but may rather be a consequence of such air movements after these have been actually instituted in some other way.

15. The storm conditions in New England had undergone slight modifications, the rain and brisk northwest winds continuing to characterize this day. In the west the storm, of marked energy, had developed, central in Kansas; lowest barometer reading, 29.18 inches at Dodge City. High winds occurred around the center: 60 miles per hour at Amarillo, Tex.; 47 miles at Pueblo, Colo. Rain had now begun on the northern side of the storm; also, rain fell on the Pacific coast. The temperature fell in the Rocky Mountain districts and was nearly stationary in the other districts. Heavy precipitations in New England had caused freshets in the Hudson River and the streams of New England. Rains above 1 inch were reported during the 14th or 15th at Northfield, 1.90; Portland, Me., 2.80; Boston, 1.10; Montreal, 1.08.

16. The storm central over Kansas on the 15th advanced to Arkansas, attended by rains in the central valleys. The

barometer was high over the Canadian Provinces and over the southern Rocky Mountain districts; it was low over the northern Pacific coast States. The temperature fell in the Western States and rose in the east Gulf and south Atlantic States. Rain along the New England coast, sometimes turning into snow; the freshets in the rivers still continued high. Rain also fell on the Pacific coast and heavy precipitation occurred at Keokuk, 1.06, and Des Moines, 1.22.

17. The central storm moved eastward into Georgia, accompanied by heavy precipitation. Rainfalls of 1 to 5 inches were reported from 31 stations in Tennessee, east Gulf and the south Atlantic States. The winds were not heavy, as the strength of the storm appeared to dissipate itself in rain. The barometer remained high over the St. Lawrence Valley and Lake region, and on the middle and north Pacific coasts. The temperature fell in the Southern States and rose in the northwest.

18. The Georgia storm passed off to the eastward, attended by heavy rains. Light rain fell in the Upper Missouri Valley and on the north Pacific coast. An area of high pressure extended from the Lake region southwestward to Texas. Light frosts were reported in northwestern Texas, Kansas, Colorado, and Missouri on the mornings of the 17th and 18th. The temperature fell over the Southern States and the extreme northwest, and rose from the Dakotas over the middle Rocky Mountain region.

19. No well-defined storm appeared within the region of observation. The barometer was relatively low on the south Florida coast and over eastern Montana. An area of high pressure occupied the Lake regions and the central valleys, and the pressure was also high on the north Pacific coast. Fair weather prevailed, except on the east Florida coast and at points in the Dakotas and western Minnesota, and along the Pacific coast, where showers were reported. The temperature rose  $10^{\circ}$  to  $20^{\circ}$  in the extreme northwest.

20. A storm of moderate strength developed over South Dakota, attended by showers in the Upper Missouri Valley. The barometer was highest on the north Pacific coast, and an area of high pressure extended from the Ohio Valley over the Gulf States. The temperature rose in the west and southwest and fell in the extreme northwest.

21. The storm moved eastward over the Lake region with moderate strength, attended by local rains from the Lake region over the Upper Mississippi and the Lower Missouri valleys, and the middle-western States. An area of high pressure covered the Rocky Mountain region, and the barometer was also high over the south Atlantic and east Gulf States. The temperature fell from the western Lake region over the middle and southern Rocky Mountain districts, and also over the middle Atlantic States. It rose from the eastern Lake region, over the east Gulf States, and in the northwest.

22. The storm advanced to the Lower St. Lawrence Valley, attended by rain from the Lake region over the Ohio and Mississippi valleys and the interior of the Southwestern States. An area of high pressure moved southeastward over the middle and southern Rocky Mountain districts, attended by a decided fall in temperature, and light frosts in the middle Rocky Mountain districts. The temperature also fell in the Lake region, the Ohio and Upper Mississippi valleys, and rose in the northwest.

23. The barometer was low over the St. Lawrence Valley and north of the Dakotas, and was high over the Southern and Southwestern States. The temperature fell in New England and the southwest, and rose in the west and northwest. Showers occurred in New England and the eastern Lake region, North Carolina, and Texas. Heavy precipitation was reported during the 22d or 23d at Texarkana, 2.00; Corsicana, 1.80; Weatherford, 2.00.



24. A storm of moderate intensity moved from Manitoba eastward over the upper Lake region, and an area of high pressure appeared north of Montana. The barometer continued relatively high over the south Atlantic and Gulf States. The temperature rose in the Lake region and fell in the extreme northwest. Showers occurred in the northwest, in the south Atlantic States, over Lake Superior, and in the southwest.

25. The barometer was low in the St. Lawrence Valley and over the Rocky Mountain and plateau districts. It was high over the south Atlantic States and Manitoba. The temperature rose over the eastern districts and fell in the west and northwest. Showers occurred in the southwest and in the middle Gulf States.

26. No well-defined storm was observed on the map. The barometer was low over the Rocky Mountain region and high over the upper Lakes and on the south Atlantic coast. The temperature fell in the Lake region and New England, and rose in the west and southwest. Showers occurred in the Ohio and middle and lower Mississippi valleys; also in the Gulf and south Atlantic States.

27. A storm was developing over the Lower Mississippi Valley on the morning of the 27th. The barometer was low over the plateau and Rocky Mountain districts and on the north Pacific coast. It was highest over the St. Lawrence Valley and the extreme northern Lake region. The temperature fell in New England and the southwest, and rose in the northwest. Showers occurred generally south of the Lake region, along the New England coast, in Wyoming, western Nebraska, and on the middle Pacific coast. Heavy precipitation in twenty-four hours was reported at Aberdeen, 2.00; Okolona, 2.30; Batesville, 2.30; Hernando, 2.00; Holly Springs, 2.20; Atlanta, 1.20; Rome, 1.20; Cordova, 1.40; Warrior, 1.50.

28. A storm appeared to be developing over the middle-western States; the barometer continued low over the Southern States, and was highest off the New England coast. The temperature fell in the south Atlantic States and in the northwest. Rain fell in the Atlantic coast States south of New York and in portions of the northwest. Heavy precipitation was reported at Danville, 2.00; Clarksville, 3.10.

29. The storm of moderate strength in the middle-western States continued in the same locality. The barometer remained low over the Southern States, highest off the New England coast, and high on the north Pacific coast. The temperature fell in the south Atlantic States, and rose generally in the central valleys and the Lake region. Rain fell in the Atlantic coast States south of New York and in the middle and upper Missouri and extreme upper Mississippi valleys and the Lake Superior region. Heavy precipitation reported at Sioux City, 1.34; Wilmington, 2.64; Hatteras, 1.06; Raleigh, 1.32; Norfolk, 1.48; Lander, 1.06; Omaha, 1.66; Danville, 2.00; Clarksville, 3.10.

30. The storm in the middle-western States remained stationary, diminishing in strength. The barometer fell over the middle Atlantic and New England States, and rose over the Southern States. It was highest over the Lake Superior region. The temperature rose over the middle Atlantic and New England States, and fell over the northern Lake region and the middle Rocky Mountain districts. Rain had fallen along the Atlantic coast over Lake Superior and in the Missouri Valley and Rocky Mountain districts. Heavy rain reported at 7 a. m. at Goldsboro, 1.80; Lumberton, 1.50; Newbern, 2.10; Weldon, 1.70; Alapaha, 2.20; Hatteras, 1.32; Charleston, 1.22; Jacksonville, 1.04; Valentine, 2.08; Rapid City, 1.24; Lander, 3.44; and at 7 p. m. at Newbern, 1.80.

## NORTH ATLANTIC METEOROLOGY.

### WEATHER AND ICE IN GREENLAND.

The following items, dated April 28, at Ivigtut, Greenland, are taken from a letter by Mrs. Peary, published in the Bulletin of the American Geographical Society:

The winter at Ivigtut has been very mild, so that it was possible to work in the open mines until January 10, when the winter commenced, but without severe frost.

We believe this season will form an exceptional one in the Arctic, and it will be possible for a ship to reach Whale Sound without much difficulty. The winter was so mild the ice did not solder and was constantly moving south; hence its early appearance (February 22) along the southwestern coast of Greenland.

Our ships have been trading to Ivigtut for the past eighteen years, and the mild winter and early appearance of ice on the coast is a rare exception.

A cablegram of September 2 from St. Johns, N. F., states that on July 15, at Holsteinberg, the *Kite* reported very little ice west of Greenland and apparently little throughout Baffin Bay.

### OCEAN FOG FOR APRIL.

The limits of fog belts west of the fortieth meridian, as reported by shipmasters, are shown on Chart I by dotted shading. East of the fifty-fifth meridian fog was reported on 16 dates; between the fifty-fifth and sixty-fifth meridians, on 12 dates; and west of the sixty-fifth meridian on 15 dates. Compared with the corresponding month of the last seven years, the dates of occurrence of fog east of the fifty-fifth meridian numbered 2 more than the average; between the fifty-fifth and sixty-fifth meridians, 2 more than the average; and west of the sixty-fifth meridian, 5 more than the average. The occurrence of fog along the steamship tracks west of the

fortieth meridian and at stations of the Weather Bureau along the middle Atlantic and New England coasts generally attended the approach or passage of storms.

### OCEAN ICE FOR APRIL.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for April during the last thirteen years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
April, 1883 .....	40 49	52 06	April, 1883 .....	48 00	43 00
April, 1884 .....	41 36	48 46	April, 1884 .....	45 35	43 34
April, 1885 .....	41 40	49 50	April, 1885 .....	44 10	39 41
April, 1886 .....	40 51	48 39	April, 1886 .....	47 43	30 11
April, 1887 .....	40 08	50 04	April, 1887 .....	48 00	38 18
April, 1888 .....	41 38	50 00	April, 1888 .....	47 40	49 00
April, 1889 .....	48 57	50 30	April, 1889 .....	47 16	43 11
April, 1890 .....	40 00	49 40	April, 1890 .....	47 36	35 42
April, 1891 .....	40 01	48 34	April, 1891 .....	45 33	43 33
April, 1892 .....	49 46	49 37	April, 1892 .....	48 58	44 37
April, 1893 .....	49 36	50 14	April, 1893 .....	46 50	46 05
April, 1894 .....	49 00	51 10	April, 1894 .....	44 56	44 00
April, 1895 .....	39 22	66 08	April, 1895 .....	47 00	45 08
Mean .....	41 16	51 00	Mean .....	46 50	43 00

The limits of the region within which icebergs or field ice were reported for April, 1895, are shown on Chart I by crosses. The southernmost ice reported, a quantity of broken field ice observed on the 28th in the position given, was about 2° south of the average southern limit, and the easternmost ice reported, several large bergs, on the 23d in the position given, was about 3½° west of the average eastern limit.